**Unit 4 Exam Review Answers**

1. 5 – 10%; 2 – 20%; 2 – 30%; 1 – 50%

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| X | 10% | 20% | 30% | 50% |
| P(X = x) | 5/10 | 2/10 | 2/10 | 1/10 |

1. P(>20%) = P(30%) + P(50%) = 2/10 + 1/10 = 0.30
2. P(<20%) = P(10%) = 5/10 = 0.50
3. 
4. 

OR: binomial B(3, 0.1) P(X = 0) = 0.729

1. 
2. 

OR: binomial B(5, 0.1) P(X>1) = 1- P(X<0) = 0.4095

1. Both are incorrect. Each roll of the rubber cube is independent of any other roll. So the probability of getting a 50% discount is the same no matter what the previous values were.
2. Dogs and cats
3. D = Family owns at least one dog

C = Family owns at least one cat

(.39 + .34) - .60 = .13

.40

.21

.26

.13

C

D

1. 
2. 
3. 
4. No. . A household can own a cat and a dog at the same time.
5. Yes. Knowing that a family has a dog doesn’t change the probability that they own a cat. P(C) = 0.34; P(C|D) = 0.33
6. a. P(X = 3) = 0.28

b. P(X ≤ 3) = 0.16 + 0.22 + 0.28 = 0.66

c. P(1<X≤4) = 0.22 + 0.28 + 0.20 = 0.70

d. E(X) = 1(0.16) + 2(0.22) + 3(0.28) + 4(0.20) + 5(0.14) = 2.94

Var(X) = (1 – 2.94)2(0.16) + (2 – 2.94)2(0.22) + (3 – 2.94)2(0.28) + (4 – 2.94)2(0.20) + (5 – 2.94)2(0.14)

Var(X) = 1.6164

SD(X) = 1.2714

1. (a) P(A U B) = 0.65 + 0.23 – 0.15 = 0.73

(b) P(B|A) = 0.15 = 0.2307

0.65

(c) No. P(A n B) is not 0

(d) Possibly. P(B|A) is very close to P(B). Justify whatever answer you give!!

1. P(D U C) = P(D) + P(C) = 0.78
2. P(K n R) = P(K)\*P(R) = 0.1633
3. (a) P(F n H) = P(H|F) \* P(F) = 0.0429

(b) P(F U H) = P(F) + P(H) – P(F n H) = 0.5671

1. P(A U B) = P(A) + P(B) – P(A n B)

0.78 = 0.25 + P(B) – 0.12

P(B) = 0.65

1. P(R) = 0.37 P(U|R) = 0.15 = 0.405

P(R n U) = 0.15 0.37

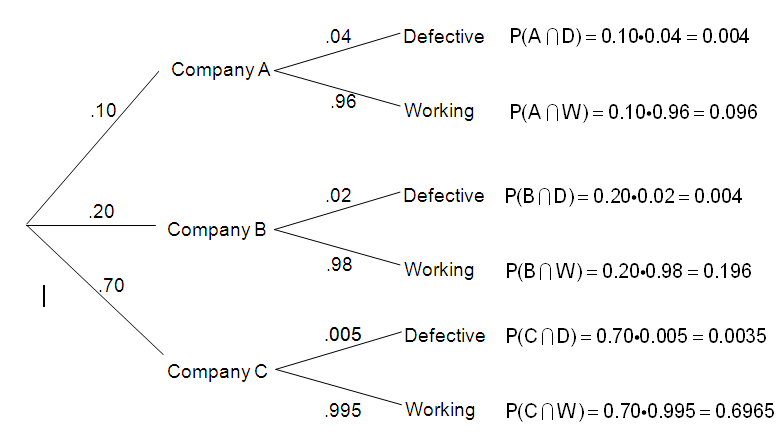
1. P(M) = 0.5 P(J|M) = 0.20 = 0.40

P(M n J) = 0.20 0.50

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  | **Breakfast** |  |  |
|  |  | **Yes** | **No** |  |
| **Sex** | **Male** | 66 | 66 | 132 |
| **Female** | 125 | 74 | 199 |
|  |  | 191 | 140 | 331 |

* 1. P(F) = 199/331 = 0.6012
  2. P(B) = 191/331 = 0.5770
  3. P(F ∩ B) = 125/331 = 0.3776
  4. P(B|F) = 125/199 = 0.6281
  5. P(F|B) = 125/191 = 0.6545
  6. No it doesn’t appear that they are independent. Knowing that a student is female changes the probability that they ate breakfast. P(B|F) = 0.6281 ≠ P(B) = 0.5770

1. Tree Diagram





1. Probability model for the payout of a prize

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| X = payout | -$2 | $73 | $148 | $248 | $498 |
| P(X=x) | 1496/1500 | 1/1500 | 1/1500 | 1/1500 | 1/1500 |

*For (b) and (c), just put X-values in L1, probabilities in L2 and then do 1-var stats L1, L2:*

b. E(X) = -$1.35

c. SD(X) = $15.06

d. E(X + X + X) = -1.35 + -1.35 + -1.35 = -$4.05

SD(X + X + X) = 

1. SAT Scores

M – score for a randomly selected male E(M) = 1532 SD(M) = 312

F – score for a randomly selected female E(F) = 1506 SD(F) = 304

1. M + F;

E(M + F) = 1532 + 1506 = 3038

SD(M + F) = 

1. M – F

E(M – F) = 1532 – 1506 = 26

SD(M – F) = 

1. Assume a normal model with N(26, 435.61).

Female scored higher than male 🡪 P(F > M) 🡪 P(M -- F < 0)

P(M –F < 0) = normalcdf(-E99, 0, 26, 435.61) = 0.4762

There is a 47.62% probability that a randomly selected female scored higher than a randomly selected male on the SAT.

1. Random Variables

|  |  |  |
| --- | --- | --- |
|  | Mean | SD |
| X | 12 | 5 |
| Y | 18 | 8 |

**a.** -2X **b.** 4Y – 7

E(-2X) = -2(12) = -24 E(4Y – 7) = 4(18) – 7 = 65

SD(-2X) = 2(5) = 10 SD(4Y – 7) = 4(8) = 32

**c.** X + Y **d.** X – Y

E(X + Y) = 12 + 18 = 30 E(X – Y) = 12 – 18 = -6

SD(X + Y) =  SD(X – Y) = 

**e.** X1 + X2 **f.** 2X – 4Y

E(X1 + X2) = 12 + 12 = 24 E(2X – 4Y) = 2(12) – 4(18) = -48

SD(X1 + X2) =  E(2X – 4Y) = 

1. Check: Bernoulli?

1. 2 Outcomes – has jumper cables or doesn’t have jumper cables

2. *p* = 0.40

3. *p* is constant

3. 10% Condition – we can assume independence as long as the number of drivers asked is less than 10% of all drivers.

1. Define Y = yes, someone can jump your car

Define N = no, someone cannot jump your car

P(N N N N N N Y) = (0.60)6(0.40) = 0.0187

1. P(X < 7) = P(X ≤ 6) = P(X = 1)+P(X=2) + P(X=3) + P(X=4) + P(X=5) + P(X=6) = 0.9533
2. Geom(0.40)

E(X) = drivers

1. B(8,0.40)

P(X = 3) = binompdf(8, 0.4, 3) = 0.2787

1. B(6,0.40)



1. B(10,0.40)



1. B(12,0.40)

E(X) = *np* = 12(0.40) = 4.8 drivers

1. B(80,0.40)

CHECK: Success/Failure Condition

*np* = 80(0.40) = 32 ≥ 10

*nq* = 80(0.60) = 48 ≥ 10

Since there were at least 10 expected successes and 10 failures we can use the normal model to approximate the binomial probabilities.

N(32,4.382)

P(X ≤ 30) = normalcdf(-E99, 30, (80\*0.40), ) = 0.324